A Case Study: The Utilization of Zebra Crossing in Terms of Work System Design

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Abstract - In everyday life, traffic accidents often occur on the highway. The road users are often not disciplined with the traffic signs that have been made by the government. Some of the road users, or pedestrians, have high possibility to get traffic accidents if the road is not supported by the infrastructure or facilities that are appropriate to the pedestrians. Vehicle drivers often do not pay attention to the existence of other road users such as pedestrians who want to cross the road. To overcome these problems, the government provides pedestrians with crossing facilities, such as zebra crossing, to minimize pedestrian accidents. However, sometimes the provisions of zebra crossing are ignored by the road users. Therefore, the productivity of zebra crossing needs to be assessed, so it can be known which zebra crossings are actually needed and used by pedestrians and which ones are not. Determining the utilization of zebra crossing can be done by work sampling method. Zebra crossing which became the object of observation consisted of 27 zebra crossings located in Malang city and its surrounding areas.

Out of 27 zebra crossings observed, 10 zebra crossings had low utilization and 17 zebra crossings had high utilization. Most of the low utilized zebra crossings were located at public areas with no public facility nearby, whereas most of high utilization zebra crossings were located near schools or colleges and shopping centers.

The low utilization of zebra crossing is due to pedestrians’ behaviors, who do not want to cross on zebra crossing. Therefore, the government should perform safety traffic socialization vigorously.

Keywords - Pedestrians’ Behavior, Utilization, Work Sampling, Zebra Crossing

I. INTRODUCTION

The development of cities will result in the increasing activity of urban society, so that mobility in highway would also increase. In the centers of the city or Central Business District, the utilization of transport is high. This situation needs adequate transportation infrastructure that can increase the level of safety, smoothness and comfort in traffic. In everyday life, traffic accidents often occur on the highway. Based on the data in 2010, there have been 66,488 accidents in Indonesia [1]. Many accidents happened because the road users are often not disciplined with the traffic signs that have been made by government.

Pedestrians are in the weakest position on the road. Because of that, pedestrians have high possibility to get traffic accidents if the road is not supported by infrastructure or facilities that are appropriate to them. Vehicle drivers often do not pay attention to the existence of other road users such as pedestrians who want to cross the road.
Ward, Cave, Morrison, Allsop, and Evans [2] in their survey stated that most of the accidents involving pedestrians occurred not at the pedestrian crossing. However, from these results, it can be pointed out that the risk of accidents increases when a pedestrian do not cross the road on the pedestrian crossing. To overcome this problem, the government provides the pedestrian crossings, such as zebra crossings or bridge crossings to mitigate pedestrians who want to cross the road so that pedestrian accidents can be minimized.

One of the pedestrian crossing facilities provided by the government is zebra crossing. Zebra crossing is a type of pedestrian crossing whose feature is alternating dark and light stripes on the road surface, and gives extra rights of way to pedestrians on the road [3].

In Indonesia, the zebra crossings are built by the government to protect pedestrians in the highway use. Similarly, in the area of Malang city, there are hundreds of zebra crossing. This action is done in relation to the fact that the number of Malang residents keep increasing and the status of Malang as a city of education keeps developed, causing many outsiders to come to Malang.

However, sometimes, the provisions of zebra crossings are ignored by the road users, either vehicle drivers or pedestrians. Vehicle drivers sometimes sabotage the zebra crossing by stopping their vehicle on it when the red light comes so that pedestrians cannot cross on it. Besides, pedestrians sometimes do not cross on the zebra crossing; they start crossing directly from their site or from their point of origin since they feel it is closer to their destination. It is, therefore, necessary for zebra crossing utilization to be accessed, so that we can know which ones are actually needed and used by pedestrians and which ones are not.

Determining the utilization of zebra crossing can be done by work sampling method. This method uses sample to analyze work activities of the machine, the workers or operators, or the effectiveness of the public facilities. We can model the zebra crossing as a working system that consists of the zebra crossing as the work facilities and the pedestrians as the involved entities. The utilization of zebra crossing is determined by the percentage of its utility, which is defined as how many times the zebra crossing is used by the pedestrians to cross the road compared with the total observations conducted.

In this paper, the study is conducted to determine the utilization of zebra crossing in Malang city, Indonesia.

II. LITERATURE REVIEW

A. Pedestrians

Pedestrian is a term derived from the Latin "pedesterpedestris", that is those who walk away. Pedestrian is also interpreted as a movement of people from one point of origin to other places as a destination on foot. Pedestrian is a transport term used to describe people who walk in the path of pedestrians such as on the street, sidewalk, pedestrian special path or pedestrian crossing facilities. To protect pedestrians in the road traffic, pedestrians should walk on the road and cross on the pedestrian crossing that has been provided for pedestrians [3]. When using the highway, pedestrians in Indonesia are protected by the government regulation. The rights for pedestrians and punishments for the violation have been established in Act 14 of 1992, Government Regulation No.43 of 1993 and Act 22 of 2009.

B. Zebra crossing

Zebra crossing is a pedestrian facility that is a part of traffic safety action and traffic management action. Zebra crossing is said to be a part of traffic safety action because this facility can protect the pedestrians from traffic flows. Moreover, it is said to be a part of traffic management actions because the number of pedestrians and a sense of danger as well as denial surrounding residents can be reduced by the provision of appropriate facilities [4].

Zebra crossing is established on traffic roads that has a relatively low speed, or relatively low volume. Zebra crossing
must have adequate sight distance, so that queue of vehicles resulted from the use of crossing facility is still within safe limits. In Indonesia, the provision of zebra crossing is based on the MUTCD (Manual on Uniform Traffic Control Devices) with the following conditions: full- and white-striped pair (not dashed) with 6 inches wide and 6 feet long [4].

C. Work Sampling

Work sampling is one method of work measurement that is performed directly. Compared with other work measurement methods, this method is more efficient because the desired information would be obtained in a relatively short time and in less cost. In its development, work sampling is not only used for standard time calculation but also for the understanding of the ratio of productive and non productive time for a job. According to Wignjosoebroto [5], an outline of work sampling method can be used to:

1) Measure delay ratio of a machine, workers/operators, or other working facilities. For example, out of the total available time, how many portions of time are used by machines or workers to perform working activities and how many portions of time with no working activity at all.

2) Set a performance rating of a worker during his working time, particularly for manual jobs.

3) As well as other work measurement methods, determine process/operation of the standard time.

III. METHODOLOGY

Zebra crossings observed consisted of 27 zebra crossings. This was considered to represent all the existing zebra crossings in Malang city and its surrounding areas. Each zebra crossing’s utilization was calculated by using work sampling method.

The first step was to do pre-work sampling to directly predict how much data that were statistically needed. The observer counted the use of zebra crossing by the pedestrians. When the data were statistically sufficient, the result of observation was analyzed.

The zebra crossings were categorized based on their nearby location: school or college areas, shopping center areas and other areas. Out of 27 zebra crossings, 9 zebra crossings were near school or college areas, 6 near shopping centers, and 12 near the other areas.

IV. RESULTS AND ANALYSIS

Observations provide the results as presented in Fig. 1 and Fig. 2. The utilization is indicated by the percentage of time in which pedestrians use the zebra crossing. From all zebra crossings observed, ten zebra crossings have low utilization since it has utilization below 50%. There are mostly located in public streets with no school or college or shopping center nearby so pedestrians rarely use it.

![Fig. 1 Zebra crossing utilization](image1)

![Fig. 2 Zebra crossing utilization based on site](image2)

The remaining zebra crossings located near schools or college areas and shopping areas have high utilization. Schools and
college areas are in the highest utilization because students and teachers use them to go to school and go back from school. Weekday is the culmination of vehicles and pedestrians at this area. The high utilization zebra crossing is also found in the shopping centre areas. This is because many people come to the shopping centre, especially on holidays or on weekend.

The low utilization of the zebra crossing may be caused by the preference of 8-10% of pedestrians who choose to cross the road not in crosswalk facilities. This is due to pedestrians’ behavior. Pedestrians are unlikely to go through a complex decision-making process every time they cross a road. Rather, they may have tendencies to make relatively safe or unsafe choices which are supported and reinforced by their beliefs and attitudes. As a result, their responses to the scenarios may reflect their typical road crossing behavior. When the behavior is seen to be easy to perform, the person is more likely to engage in a potentially hazardous safety-behavior on the road [6]. The pedestrians seem to be less concerned about zebra crossings. Pedestrians tend to pass through the road that there is no zebra crossing because it is closer to their destination. This obviously makes a malicious traffic; motor vehicles may hit pedestrians crossing carelessly. The government designs zebra crossings in order to maintain the safety of pedestrians. But, they usually look for the closest distance to the destination without regarding their safety on the highway.

Besides that, the vehicle drivers tend to neglect the existence of pedestrians even they see pedestrians who will cross the road. They do not decrease the vehicle speed, so the pedestrians could not cross the road without endangering themselves. This condition happens especially in non-signalized zebra crossings. This also happens in signalized zebra crossing, since many road users neglect the signs and sometimes the officers do not manage the traffic to help pedestrian who wants to cross the road.

Another reason of the low zebra crossing utilization is that the government sometimes locates zebra crossing at site in which there has already been another zebra crossing. This makes pedestrians confused which zebra crossing they should take.

The last reason is that Indonesians prefer to use a motor vehicle to walk as passing the public streets. The use of a motor vehicle is considered more practical than having to walk away.

Further improvements in road safety may be best achieved through attempts to encourage better attitudes towards road safety behaviors (Quimby and Drake, 1989). It must be supported by the government. The government should be more vigorous in providing traffic safety socialization. Furthermore, the government should consider road users’ needs when building traffic facilities. For example, when the government wants to establish any zebra crossing, the government should consider where the best location is, based on pedestrians’ needs so that the zebra crossing will have high utilization.

V. CONCLUSIONS

The following conclusions can be drawn from present study:

1) Zebra crossings located near schools, colleges or shopping centers are the most widely used by pedestrians.

2) Zebra crossings located in the area which is nearby to schools, colleges, or shopping centers have low utilization.

3) Zebra crossing must be located in the area where pedestrians would like to cross on it safely.

4) The government should consider pedestrians’ needs when establishing zebra crossings and should be more vigorous in providing traffic safety socialization.

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REFERENCES


